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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

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☐ *Additional inventors are being named on the ^ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

SYSTEM AND METHOD FOR DISPLAYING AN IMAGE STREAM

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

☒ Customer Number **27130** → *Place Customer Number Bar Code Label here*

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ENCLOSED APPLICATION PARTS *(check all that apply)*

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☐ Application Data Sheet. See 37 CFR 1.76 ☒ Other (specify) **postcard**

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

☐ Applicant claims small entity status. See 37 CFR 1.27.

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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are:

Respectfully submitted,

Date **31 / Dec / 2003**

SIGNATURE

REGISTRATION NO. *(if appropriate)* **37,912**

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Docket Number: **P-6472-USP**

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

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P-6472-USP

United States Provisional Patent Application For:
SYSTEM AND METHOD FOR DISPLAYING AN IMAGE STREAM

FIELD OF THE INVENTION

The present invention relates to a method and system for displaying and/or reviewing image streams.

BACKGROUND OF THE INVENTION

An image stream may be assembled from a series of still images and displayed to a user. The images may be created or collected from various sources. For example, U.S. Patent No. 5,604,531 to Iddan et al., assigned to the common assignee of the present application and incorporated herein by reference, teaches, inter alia, an in-vivo imaging system which in one embodiment includes a swallowable capsule. The imaging system may, for example, capture images of a lumen such as the gastrointestinal (GI) tract and may transmit them to an external recording device. Large numbers of images may be collected for viewing and, for example, combined in sequence. An image stream of, for example, 40 minutes in length, containing for example about 4,800 frames, may be available to, for example to a health professional for review. Other numbers of frames or lengths may be used. In one embodiment, a health professional may, for example, use the images to diagnose pathological conditions of the GI tract, and, in addition, the system may provide information about the location of these pathologies. Pathology, if present may typically be found in only a few locations along the long traverse of the GI tract, and therefore in a small percentage of the recorded images.

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In general, a user may try to set the streaming rate to the highest rate where the user can quickly review the image stream without missing important information that may be present in any of the images included in the stream. The rate at which a user can effectively review an image stream may be limited by a physiological averaging above which certain details in individual images displayed in the stream may be physiologically filtered out.

SUMMARY OF THE INVENTION

The system and method according to embodiments of the present invention may allow an image stream to be viewed while emphasizing images that may be of interest (e.g., images of pathologies). Thus, a user may quickly locate selected images of interest out of a lengthy image stream and an efficient and short view time may be provided.

In one embodiment, a system and method method may display an in vivo image stream. An in vivo image stream may be displayed as a multi-frame stream, and frames displayed in a single time slot may be spatially positioned based on for example a predetermined criterion.

In one embodiment, a system and method are provided for displaying an image stream, such that multiple images from the image stream are displayed substantially simultaneously in a time slot. As such a single-frame stream may be converted to a multi-frame stream that may be shorter in length. In a further embodiment of the invention, the spatial position of the images displayed substantially simultaneously in each time slot may be adjusted based on a

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predetermined criterion. For example, the spatial order of the images displayed substantially simultaneously in each time slot may correspond to a degree of variation of each image compared to a selected or generated reference image. In a further example, images displaying pathological looking tissue may be positioned away from images displaying healthy looking tissue. In one embodiment of the invention, images from a group of images displayed substantially simultaneously, containing a high degree of variation as compared to the other images in the group may be displayed in a spatial position where a viewer may typically draw his/her eyes first. In certain embodiments, the images may be collected from a swallowable device, such as a capsule or other suitable shaped device, traversing the GI tract.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the drawings in which:

Figure 1A shows a schematic diagram of an in-vivo imaging system according to one embodiment of the present invention;

Figure 1B shows a schematic diagram of a monitor display according to one embodiment of the present invention;

Figure 2 shows a portion of a display according to an embodiment of the present invention;

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Figure 3 shows a flow chart describing a method for spatially positioning a plurality of image frames displayed substantially simultaneously, according to an embodiment of the present invention;

Figure 4 shows a flow chart describing a method for spatially positioning a plurality of image frames displayed substantially simultaneously, according to another embodiment of the present invention;

Figure 5 shows a portion of a display according to a second embodiment of the present invention;

Figure 6 shows an exemplary flow chart describing a method for combining multiple image streams into a single image stream according to an embodiment of the present invention; and

Figure 7 showing an exemplary flow chart for adjusting the stream rate of the multi-frame stream according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

In the following description, various aspects of the present invention will be described. For purposes of explanation, specific configurations and details are set forth in order to provide a thorough understanding of the present invention. However, it will also be apparent to one skilled in the art that the present invention may be practiced without the specific details presented herein. Furthermore, well-known features may be omitted or simplified in order not to obscure the present invention.

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Reference is made to Fig. 1A, which shows a schematic diagram of an in-vivo imaging system according to one embodiment of the present invention. In an exemplary embodiment, the system may comprise an imaging device, such as for example a device 40 which may, for example, be capsule shaped, having an image sensor 46, for capturing images, an illumination source 42, for illuminating the body lumen, a transmitter 41, and an antenna 44, for transmitting images and possibly other information to, for example, a receiving device. Typically, the imaging device may correspond to embodiments described in U.S. Patent No. 5,604,531 to Iddan et al., and/or to embodiments described in published application WO01/65995 to Glukhovsky et al., both of which are incorporated herein by reference in their entirety, but in alternate embodiments there may be other types of imaging devices. Device 40 may be a capsule, but may have other suitable shapes or configurations. In one embodiment, an imaging device may include more than one image sensor. The image sensors may, for example be arranged at either end of device 40, or at the same end of the capsule, in slightly different positions or different angles. A device, which includes a plurality of image sensors, may be described for example, in International Publication Number WO 02/054932 which is assigned to the common assignee of the present invention and which is hereby incorporated by reference.

Reference is now made to Fig. 6, showing an exemplary flow chart describing a method for combining multiple image streams into a single image stream according to one embodiment of the present invention. Each image sensor may capture in vivo images and transmit the in vivo images via the transmitter 41

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or via separate transmitters. The separate image streams obtained from the multiple image sensors may be stored (step 610). Comparison may be made between frames captured from the separate image streams (step 620). In other embodiments of the invention, the separate image streams may not be stored in their entirety or at all before comparison is made. Based on the comparison, frames from each of the separate image streams may be slotted or placed into a single image stream (step 630). Other operations and combinations of operations may be used. Other methods besides or in addition to comparing frames may be used to combine multiple image streams. The separate image streams may be combined such that frames displaying similar scenery are slotted or placed in close proximity to each other. Other suitable criteria may be used as well.

In another embodiment of the invention, device 40 may include sensors 43 other than image sensors such as for example, a temperature sensor, a pressure sensor, a blood sensor, a pH sensor, an ultrasound sensor, an oxygen sensor, etc., and may include more than one sensor. Data sampled from sensor 43 may for example be transmitted via transmitter 41 or via separate transmitters, or need not be transmitted.

Typically, located outside the patient's body in one or more locations may be an image receiver 12, a data processor 14, and an image monitor 18. Image receiver 12 may typically include an antenna or antenna array (not shown) and an image receiver storage unit 16. Data processor 14 may include a processor 19 and a storage unit 21. In one embodiment of the present invention, storage unit 21 may include an image database 22. Image monitor 18 may display, *inter alia*,

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images recorded by, for example, device 40. Typically, data processor 14 and monitor 18 may be part of a personal computer or workstation, which includes standard components such as processor 19, a memory, a disk drive, and input-output devices, although alternate configurations are possible. Data processor 14 may typically, as part of its functionality, act as a controller controlling the display of the images. Image monitor 18 may typically be a conventional video display, but may, in addition, be any other device capable of providing images or other data and may be of any size monitor including large projection size monitors. The image monitor 18 presents the image data, typically in the form of still and streaming image frames, and in addition may present other information. In an exemplary embodiment, the various categories of information are displayed in windows. Other displaying formats may be used. Multiple monitors may be used to display image and other data. The images captured by the imaging system may be of any suitable shape including for example circular, square, rectangular, or hexagonal, oval etc.

In operation, image sensor 46 may capture images and may send data representing the images to transmitter 41, which may transmit data to image receiver 12 using, for example, electromagnetic radio waves. Image receiver 12 may transfer the image data to image receiver storage unit 16. After a certain period of time of data collection, the image data stored in storage unit 16 may be transferred to the data processor 14 or the data processor storage unit 21. For example, the image receiver 12 or image receiver storage unit 16 may be taken off the patient's body and may be connected to the personal computer or workstation

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that may include the data processor 14 via a standard data link, *e.g.*, a serial, parallel, USB, or wireless interface of known construction. According to one embodiment the image data may then be transferred from the image receiver storage unit 16 to an image database 22 within data processor storage unit 21. Typically, the image stream is stored as a series of images in the image database 22, which may be implemented in a variety of known manners. Data processor 14, including possibly dedicated software may analyze the data and provide the analyzed data to the image monitor 18, where a user views the image data. In one embodiment of the invention, more than one image stream may be captured from more than one image sensor. In this embodiment, data processor 14 may be used to combine the separate image streams into one image stream. The combining of the two or more image streams may be for example, based on comparing images from each image stream, based on time of image capture, or based on other criteria or more than one criterion. Other configurations allow for real time viewing where, for example, device 40 or imager receiver 12 may transmit data in real time to data processor 14 for real time viewing on monitor 18.

Typically, according to one embodiment, an in-vivo imaging device, such as for example device 40, may collect a series of still images as it traverses the GI tract. In one embodiment of the present invention, device 40 may collect a large volume of data, as it may take several hours to traverse the GI tract, and may record images at a rate of, for example, two images every second, resulting in the recordation of, for example, thousands of images. The image recordation rate (or frame capture rate) and recordation duration may be varied.

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Typically, the image data captured and transmitted by the device 40 may be digital color image data, although in alternate embodiments other image formats may be used. In an exemplary embodiment, each frame of image data may include 256 rows of 256 pixels, each pixel may include bytes for color and brightness, according to known methods. In one embodiment, 4x4 "sub" pixels may be included, each sub-pixel including red, green and blue data, one color per pixel, with one color repeated. Other suitable methods of recording image data may be used. Typically, images may be stored sequentially in data processor storage unit 21. Other image formats may be used.

Typically, data processor storage unit 21 may store a series of images captured by device 40, for example, as it moves through a patient's GI tract (other lumens may be imaged). The series of images may be combined, typically consecutively, to form an image stream. When viewing the image stream, the user may be typically presented with one or more windows on monitor 18; in alternate embodiments multiple windows need not be used and only the image stream may be displayed. Reference is now made to Fig. 1B showing a schematic diagram of display 18 according to one embodiment of the invention. In an embodiment where multiple windows are provided, for example, an image window 50 may display the image stream or portions (for example still portions) of that image stream. A sensor window 53, may display a concurrent stream of data from sensors other than image sensors, for example, ultrasound, pressure, temperature, blood, oxygen, and/or a pH sensor. Other sensors may be used. A location window 52 may display information on the location of the imaging device, for

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example, device 40, at the time of capturing the image frames being displayed. A control window 54 may include buttons or other controls that may alter the display of the image; for example, stop, play, pause, capture image, step, fast-forward, rewind, or other. Such controls may be activated by, for example, a pointing device such as a mouse or trackball. Typically, the image stream may be frozen to view one frame or one set of frames, speeded up, or reversed; sections may be skipped; or any other method for viewing an image may be applied to the image stream. Other windows may be included.

While the following discussion relates to the case where data from a device 40 is stored for later use, the system and method of the present invention may be used with systems allowing for real time viewing of image data.

Furthermore, while typically the components accepting, processing and displaying the image data are contained within a workstation system or PC, other systems may be used, and other (*e.g.*, distributed) components may perform such image accepting, processing and displaying. For example, a large projection type monitor may be used to view a plurality of images substantially simultaneously.

In one embodiment, the imaging window may display a shortened multi-frame stream where multiple images are displayed substantially simultaneously in each time slot. For example, in one embodiment, the original image stream may be divided into, for example, separate image streams displayed substantially simultaneously in single time slots. Various suitable methods may be used to separate an original image stream into a plurality of image streams to be streamed substantially simultaneously. In one example, images from the original image

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stream may be divided into, for example, 16 subset image streams such that, for example, during the first time slot, the first 16 images of the original image stream may be displayed substantially simultaneously, and in the second time slot the next 16 images of the original images stream may be displayed substantially simultaneously, etc. Other number of image streams may be used and some frames in the original stream may be skipped. In alternate embodiments, the images may be separated for example, placed in different files or memory blocks in processor 14. In one embodiment, each resulting image stream includes a separate subset of images from the original image stream; in alternate embodiments, the images from each resulting image stream may overlap. In another embodiment of the invention, images of the original image stream may be divided between the separate image streams in an alternate manner.

In one embodiment, images from the original image stream may be directed to the proper screen position at viewing time, and the image stream may not actually be separated. In such embodiments, a different number of images may be displayed substantially simultaneously for every time slot. In one embodiment, each time slot may display all image frames captured from a specified region. For example, the first time slot may include all frames captured in the esophagus, the second time slot may display all images captured in the stomach, etc. In an alternate embodiment the same number of image frames may be displayed in each time frame.

Fig. 2 depicts a portion of a display according to an embodiment of the present invention. Referring to Fig. 2, the display 200 includes, as an example 16

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image frames displayed substantially simultaneously in a single time slot (210A-240D). In an exemplary embodiment, the windows or viewing areas, 210A, 210B etc., are close together, with a minimum of blank or black space between the frames, and typically are displayed in matrix form, to allow a viewer to see the entirety of the frames without substantially moving his eyes. Other suitable spatial arrangements may be used.

The spatial order of the image frames displayed in a single time slot may be adjusted. The spatial order of the image frames displayed substantially simultaneously may correspond to the chronological order that the images were captured, may correspond to an alternate criterion, or to more than one criterion. In one embodiment of the invention the spatial order of the frames displayed may be based on a specified criterion of interest. In one embodiment of the invention, the image frames displayed in a single time slot are spatially positioned based on a criterion of color variation.

A set of operations corresponding to an exemplary algorithm or method is listed in Fig. 3, according to one embodiment of the invention. Referring to block 318, a set of image frames to be displayed substantially simultaneously in a single time slot may be selected. Normalization of lighting or other normalization may be performed on the image frames to be displayed (block 320). This may be performed to, for example, reduce any color variation due to shadowing, variation in lighting intensity, or variation in lighting and image sensor properties when image frames may be captured from more than one image sensor. Subsequently, a reference image may be generated based on the image frames to be displayed

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(330). In one embodiment of the invention, the reference image frame may be, for example, an image representing the average or sum of the image frames to be displayed substantially simultaneously in a single time slot. In another embodiment of the present invention, the reference image may be, for example, a selected image frame that may have some known properties, an image selected or generated from a previous time slot, or other suitable images. In one embodiment of the invention, the reference image may represent a typically healthy looking tissue. In step 340, the degree of variation of frames from reference image may be determined. The variation may be based on comparing sections of images or may be based on comparing whole images. In one example, images displaying pathology may show a high degree of variation with respect to the reference image, for example when the reference image may represent a typically healthy tissue. A score may be given to each image based on the comparison performed (block 350). In another embodiment of the invention, image frames to be displayed in a single time slot may be compared to more than one reference image and receive more than one score. The spatial position of the image frames displayed may be based on the scores they were assigned (360). For example, according to one embodiment pictures having similar scores may be positioned where a viewer may typically draw his/her eyes first, e.g., at one corner of the display. Other suitable operations or sets of operations may be performed.

Other post processing methods may be included as well to differentiate between images that may display, for example, pathology and images that may display, for example, bubbles, content, or other variations through the GI tract,

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which may not be associated with pathology or other criteria of interest. In another embodiment of the present invention, the generated image may represent an average image generated from the entire original image stream, from a predetermined section of the original image stream, or from image streams taken from a pool of volunteers. In another example the generated and/or pre-selected image may represent a pathology or specific information that is being sought in the plurality of image streams. As such, images with the lowest degree of variation with respect to the reference image may be representative of the images of interest. Other suitable algorithms may be used as well. As an example, images detected as displaying blood may be a criterion of interest. Algorithms for blood detection are described, for example, in embodiments described in US Application Number 10/097,096 filed on March 14, 2002, assigned to the common assignee of the present invention and hereby incorporated by reference. In another embodiment of the invention other criteria besides or together with color variation may be used. For example, shape variation or texture variation may be used as a criterion to help identify, for example, polyps in the GI tract. Variation above or below a certain threshold based on a selected or generated image may be used. The threshold may be adjusted to increase or decrease sensitivity. Other suitable criteria may be used as well.

In yet another embodiment of the invention, the criteria of interest that determines the spatial order of the image frames in each time slot, and the number of images displayed per time slot may be based on readings concurrently obtained from sensors other than image sensor, for example the spatial positioning of image

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frames displayed substantially simultaneously in a single time slot may be based on reading obtained from one or more non-image sensors such as the sensors mentioned above. Reference is now made to Fig. 4 showing a flow chart for sorting image frames displayed substantially simultaneously in a single time slot, according to one embodiment of the invention. In step 510, images to be displayed substantially simultaneously may be selected. Corresponding sensor readings from one or more non-image sensors (e.g. temperature sensor, pressure sensor, blood sensor, pH sensor, ultrasound sensor, oxygen sensor, etc.) may be selected (step 520). For example, temperature readings recorded during the time of capturing the image frames selected in step 510 may be used. Images selected in step 510 may be sorted (step 530) based on the corresponding sensor data selected in step 520, in for example ascending or descending order. Other methods of sorting may be implemented. In one embodiment of the present invention, sorting may be based on reading of more than one sensor and may be based on image analysis as well as sensor readings. In another embodiment of the present invention, images may also be sorted based on a one or zero output of a sensor, so that all images corresponding to a one output may be grouped together and all images corresponding to a zero output may be grouped together. Images corresponding to sensor readings passing a defined threshold may be tagged (540). Such images may be emphasized during display, for example, as is described below. Other operations or series of operations may be used.

Typically, increasing the number of image frames displayed substantially simultaneously in a single time slot, may allow for the processing method

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described, for example, by way of example, in Fig. 3 and Fig. 4 to single out, for example, a relatively small number of frames showing pathology from, for example, a relatively large number of frames showing typically healthy looking tissue. Increasing the number of images displayed in a single time slot decreases the emphasis, on small variation in, for example, healthy tissue while increasing the emphasis on large variations that appear in for example, pathological tissues. In addition, according to one embodiment, increasing the number of images displayed in a single time slot decreases the length of the displayed image stream.

In one embodiment of the invention, image frames that showed, for example, a high degree of variation may be positioned in a location where the user is mostly likely to glance first, and image frames that showed, for example, a low degree of variation may be positioned where the user is most likely to glance last. In one embodiment of the present invention, it may be assumed that the user will scan the matrix of images starting at the upper left hand corner. In this embodiment, image frames that may be of interest, for example showing a high degree of variation with respect to frames, for example, representing healthy looking tissue, may be positioned in the upper left hand corner, starting with for example frame 210A (Fig. 2). Image frames that may not be of interest, for example, images showing a low degree of variation with respect to images representing healthy looking tissue, may be positioned in the lower right hand corner, ending with for example frame 240D (Fig. 2). Frames may be arranged by descending order of degree of variation. The progression from frame 210A to frame 240D may be by row based order (e.g. 210A, 210B, ...220A, 220B, ...230A,

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..240D), by column based order (e.g. 210A, 220A, .., 210B, 220B, ...210C, ...240D), or by radial based order (e.g. 210A, 210B, 220B, 220A, 210C, 220C, 230C, 230B, ...240D). Other suitable progression series may be used, such as spiral based order. In another embodiment of the present invention, image frames that may be of interest, for example showing a high degree of variation, may be positioned in the center of the image window, at a height of for example two thirds (2/3) above the bottom, while images showing a low degree of variation may be positioned in the periphery of the image window. The progression from image frames showing a high degree of variation to image frames showing a low degree of variation may be a spiral shaped. Spiral progressions may be clockwise spiral progressions, or counter-clockwise progressions. Other suitable criteria may be used besides degree of variation, and other suitable ranges may be used.

Other suitable image frame arrangements may be used as well. For example, image frames in single time slot that meet a particular criterion of interest above a defined threshold may in one embodiment of the present invention, be grouped together for emphasis, by for example, fusion at the borders to form a single entity, or emphasized by, for example, highlighting, inserting a border around grouped image frames, etc. For example, in Fig. 2 image frames 210A and 210B are highlighted by border 299. Other number of frames or types of grouping may be used.

In one embodiment of the invention, images displayed substantially simultaneously may be of different size or shape. In one example, specific images from the group of images displayed substantially simultaneously may be enlarged

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or displayed in a larger size so as to emphasize them. Reference is now made to Fig. 5 showing 46 image frames displayed substantially simultaneously, according to one embodiment. In one embodiment of the invention, image frames having for example, the highest degree of variation according to a specified criterion are place in for example the center, at a height of for example two thirds (2/3) above the bottom. In one example, images with variation above a predetermined threshold may be grouped together and displayed in larger frames such as frames 401, 402, 403, 404, and 405, 406. Other images below the specified threshold, for example, might be displayed in smaller frames such as, for example, frames 407 to 446. The sensitivity of this grouping may be adjusted by increasing or decreasing the defined threshold. The threshold may be adjusted by the user or by an algorithm adjusting the threshold based on a defined maximum and minimum number of large frames to be displayed concurrently in a single time slot along with other criteria. In another embodiment of the invention, the larger frames may be positioned at the top left corner. In yet another embodiment of the present invention different size frames may be positioned in other suitable arrangement. As such, a large number of images may be reviewed by a user, such as a health professional, while only emphasizing the typically few images most likely to contain information of interest. The typically large majority of images less likely to contain information of interest may be reviewed at a quick glance. In one embodiment of the invention, a user may pause the image streaming when identifying an image of particular interest. As such the user may examine more carefully the image or images of interest and the images taken around the vicinity of the image of interest.

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The order that the images are shown substantially simultaneously may be altered to show images for example in a chronological order. Other suitable features may be used as well to aid in the analysis of the images obtained.

In one embodiment of the invention, lighter images may be in general positioned in the upper part of the image window 50 (Fig. 1B), while in general darker images may be positioned in the lower end of image window 50. As such the continuity between subsequent time slots may be enhanced for easier viewing of a stream.

Typically, if normally a single-frame stream is displayed at a certain rate, a multi-frame stream may be displayed at a slower rate. For example if typically a single-frame stream is displayed at a rate of 20 frames per second, a multi-frame stream may be displayed for example at a rate of for example 5 or less frames per second. In such a case the overall viewing time may be up to four times less than the original single-frame stream viewing time. Other suitable viewing rates and ratios between single-frame stream and multi-frame stream viewing time may be used. In one embodiment of the invention, the viewing rate of the multi-frame stream may be adjusted based on the content of the frames displayed in each time slot and based on the transition of sequential time slots. Reference is made to Fig. 7 showing an exemplary flow chart for adjusting the stream rate of the multi-frame stream according to one embodiment of the present invention. In one example, a set of frames to be displayed in a single time slot may be examined (step 710). If one or more frames meet a predetermined criterion (step 720), such as a criterion of interest, the stream rate may be adjusted (step 750), for example, reduced. This

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may help to further emphasize frames that may be of interest. In another example, the viewing rate may be reduced where there may be a large variation in the color content in the transition between neighboring time slots. Frames displayed in neighboring time slots may be compared (step 730). If there is a large variation in frames displayed in neighboring time slots, for example a large variation in color content or texture, the stream rate may be reduced (step 740). If there is no significant variation and no frames meeting a criterion of interest, the stream rate may be maintained (step 760). In yet another embodiment of the invention, a user may adjust the frame rate as well as the number of frames displayed substantially simultaneously. In an exemplary embodiment, the user may switch modes, between viewing the images as one stream and viewing the images as a plurality of streams using a control such as a keystroke, mouse, or on-screen button. The user may control the plurality of streams in a manner similar to the control of a single stream, for example by using on screen controls. In an alternate embodiment, only one mode may be offered to the user. In yet an alternate embodiment of the invention, a user may select a mode of only viewing images meeting a defined criterion of interest.

Each image may be displayed with different post-processing. For example, one image may be subject to certain filtering or manipulation (e.g., red or green filtering, contrast enhancement, brightness alteration) and the other image may be subject to different or no filtering or manipulation. In one embodiment two or more images in a plurality of streams displayed substantially simultaneously are fused together at the borders and displayed as a single entity. As such, a user may

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comfortably and concurrently incorporate information shown in each of the images while avoiding the distraction caused by the typically sharp contrast between connecting edges or between the images and the background color which may appear between the images when the images are spaced apart. According to some embodiments fusing borders between independent images may be accomplished by, for example, one or more post processing algorithms known in the art, including but not limited to, smoothing convolution, mirroring, overlapping, linear or non-linear fade-out fade-in, truncation, linear shape distortion, non-linear shape distortion, normalization or intensity, or other suitable post-processing.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the invention is defined by the claims that follow:

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CLAIMS

1. A method for displaying an in vivo image stream according to the specification and drawings.

2. A system for displaying an in vivo image stream according to the specification and drawings.

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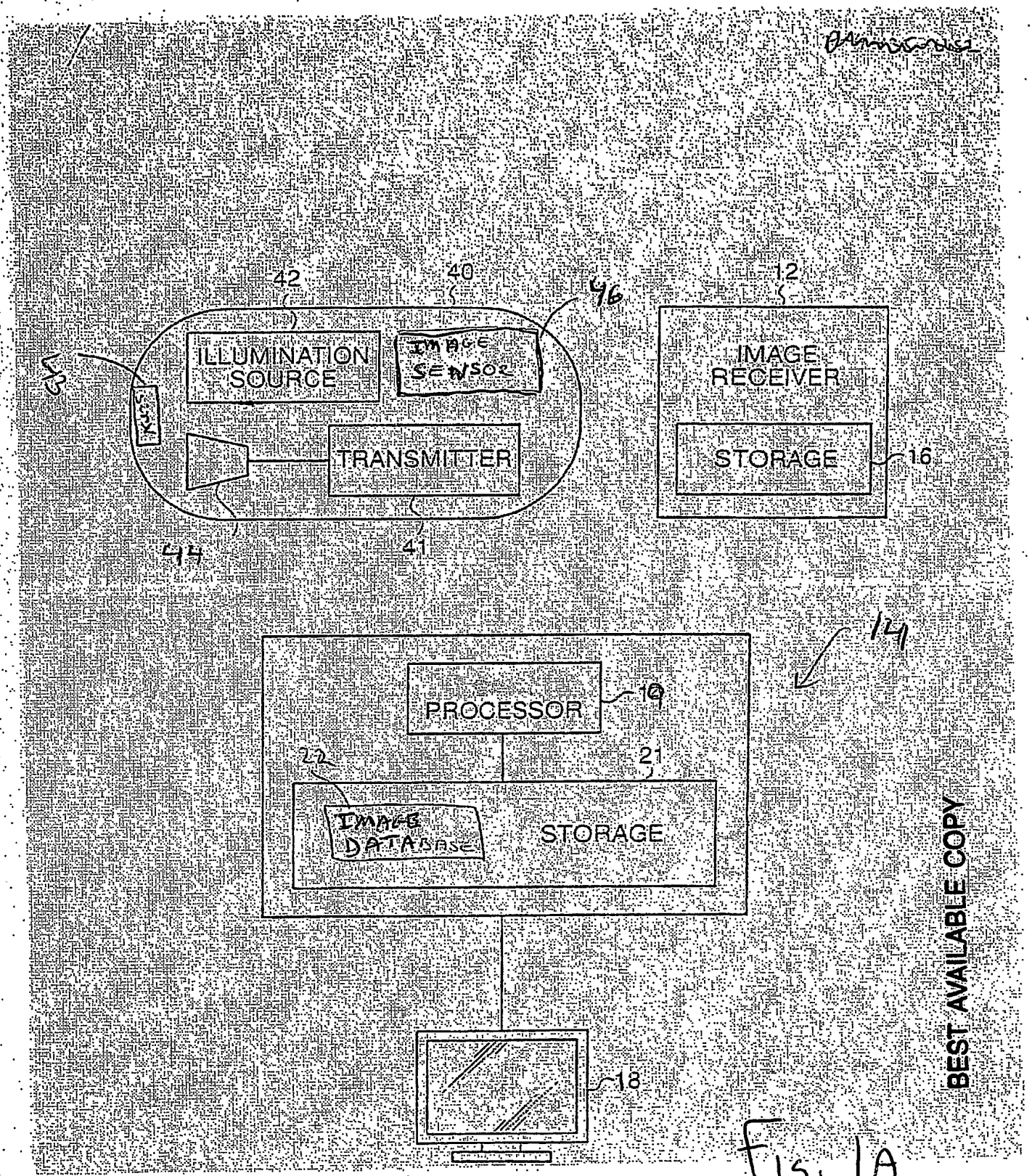

Fig. 1A

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Fig 1B

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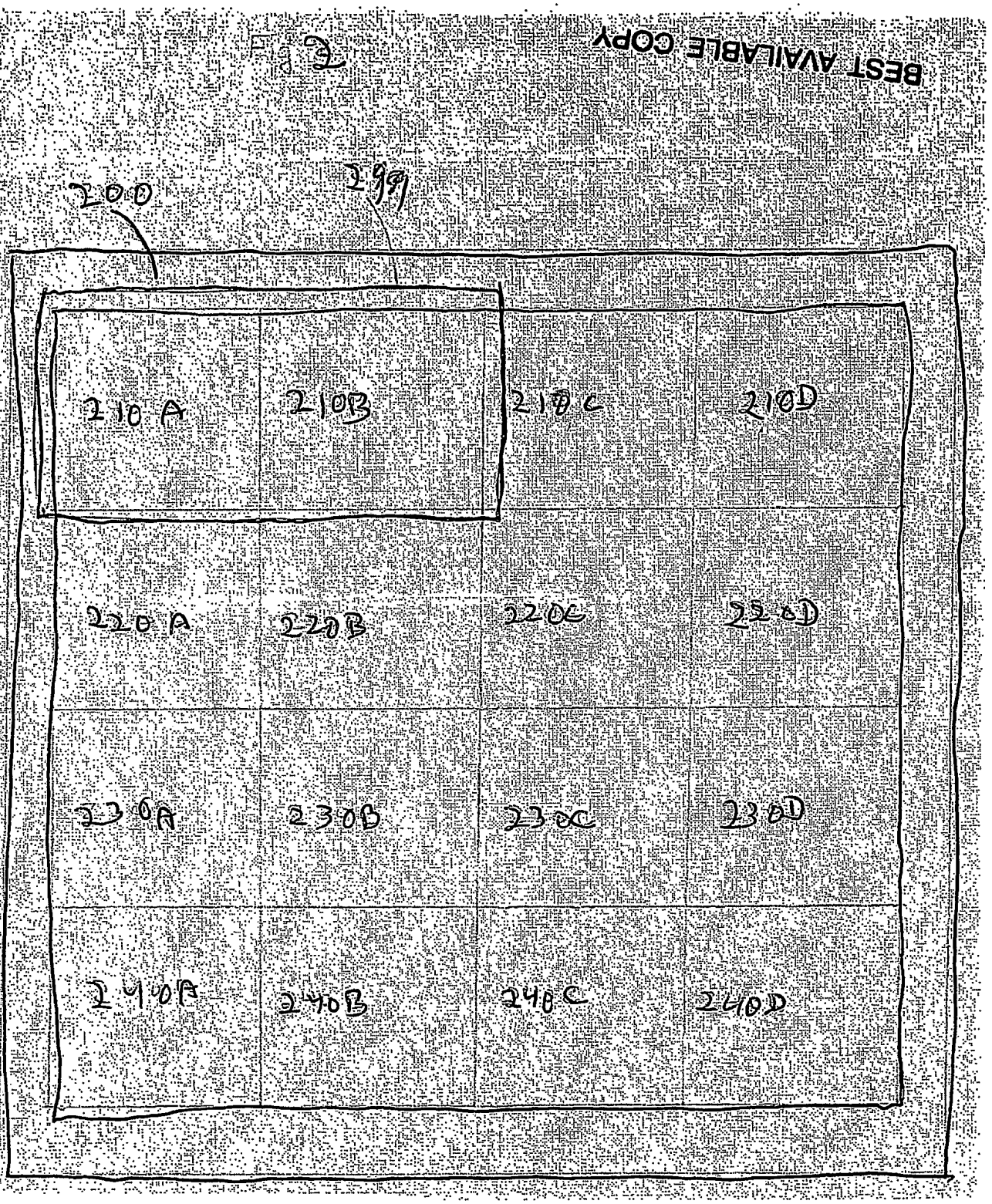
Fig 2



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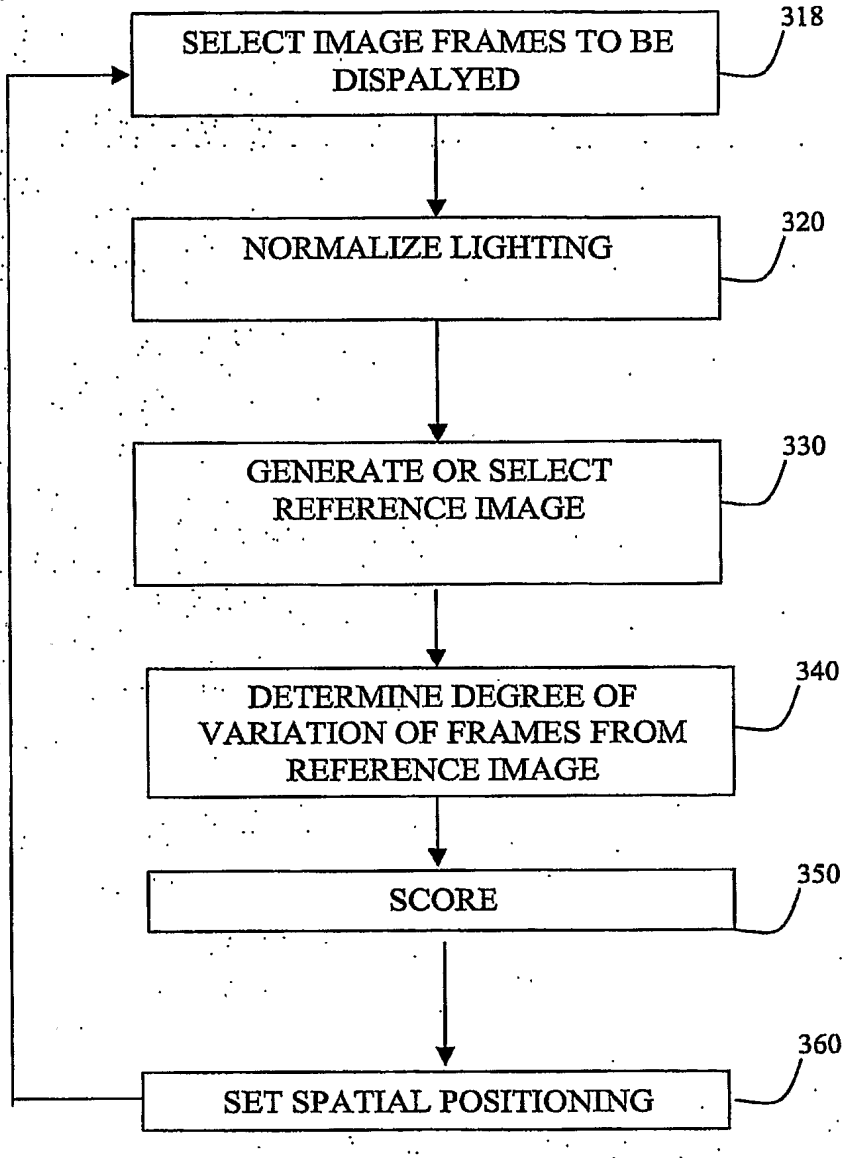

Figure 3

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Fig. 4

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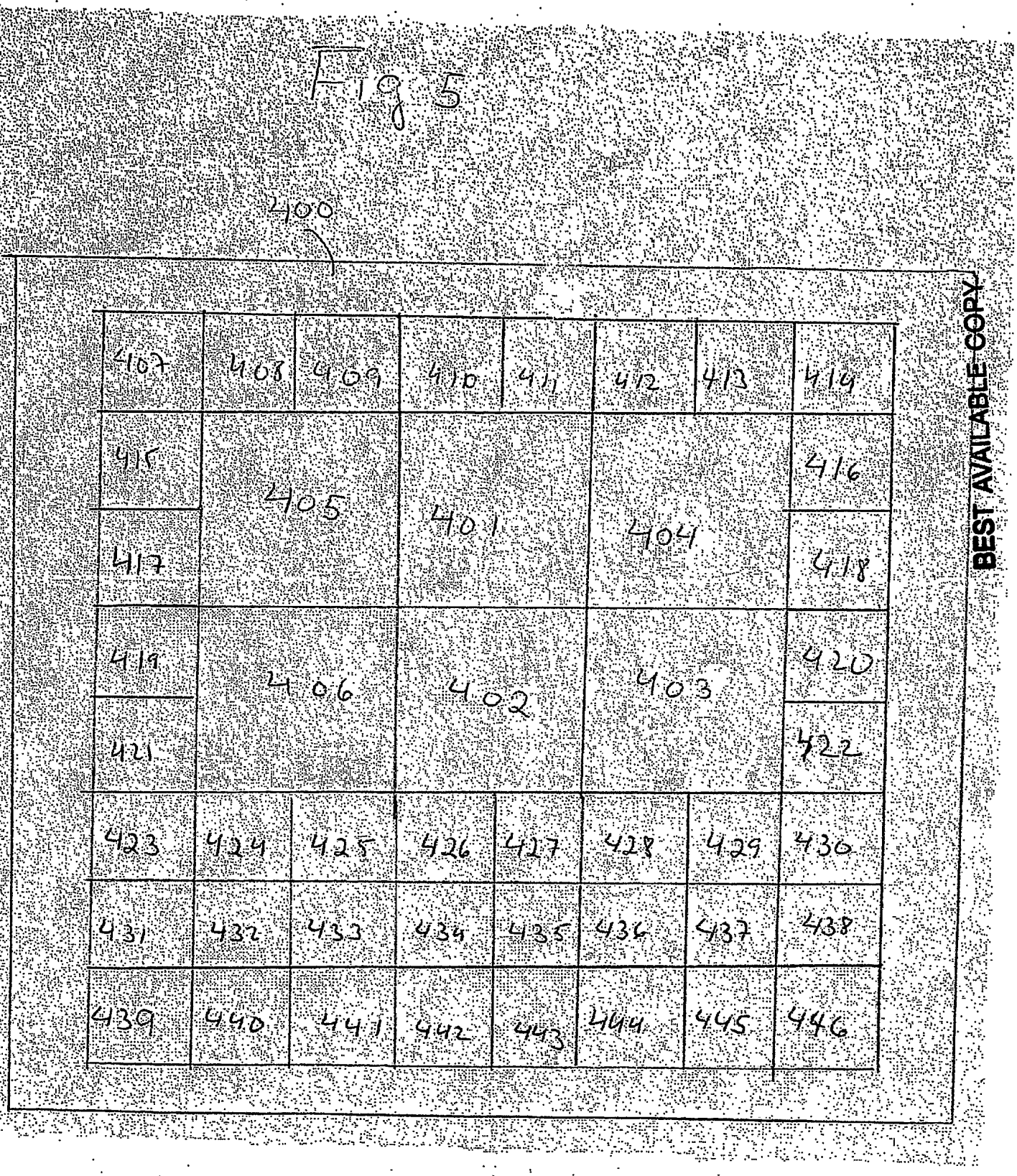
Fig 5



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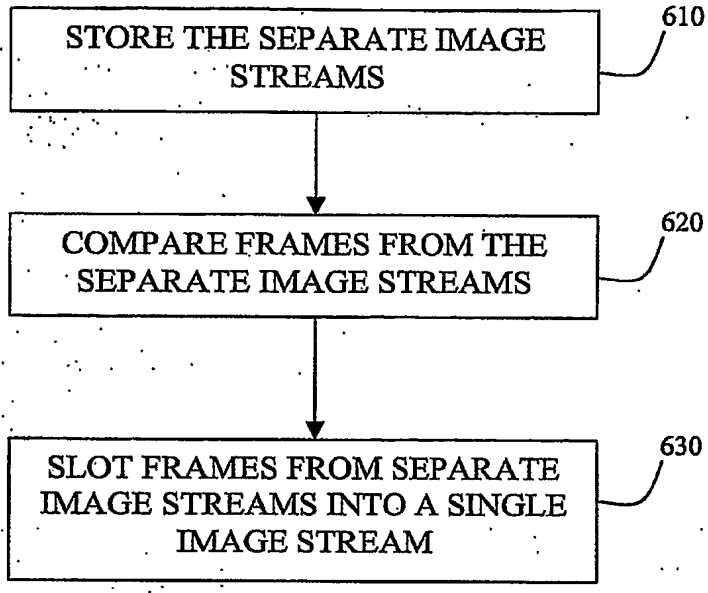

Figure 6

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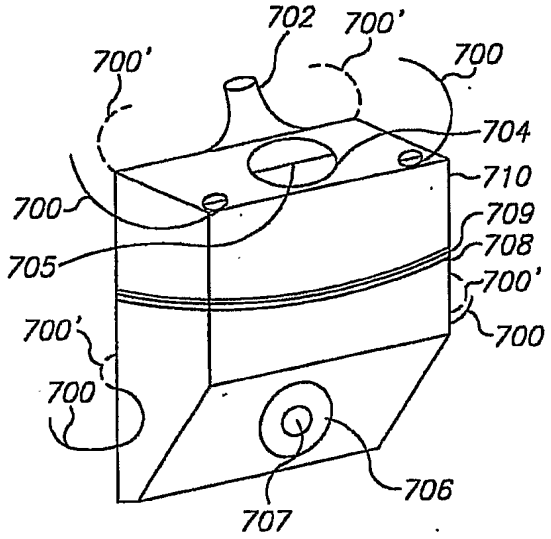

FIG.7

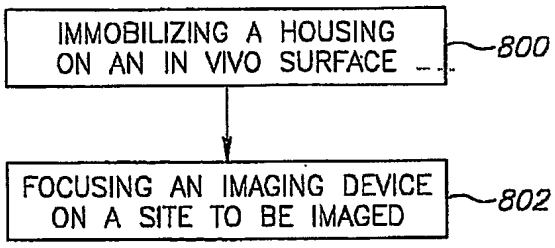

FIG.8

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